Collecting the Data

Depending on the control system, there are several options available for recording process data for tuning purposes. It may be possible to extract text files of trend displays from the control system which can then be converted into whatever format is required for the tuning software. For example, Contek's U-Tune [1] can convert text files into Dataq waveform format with the added benefit of also being able to view the trends using the Dataq browser [2]. A potential disadvantage in this method is that the control system may have processed the data between the field signals and the trending package, for example the measurements may have been scaled in engineering units or averaged over the trend sampling period, both of which can result in incorrect tuning parameters unless taken into consideration by the calculation. Collection of data using an OPC-based interface is also an option. Apart from having the same potential disadvantages as the trend text files, the availability of an OPC server is still an infrequent occurrence, especially for the roving process control consultant traveling to many different sites.

My favored option is to connect the data acquisition equipment directly onto the incoming and outgoing field signals. By effectively 'black boxing' the control system, this technique picks up the raw process variable and control output exactly as seen by the process, improving the accuracy of the process identification and subsequent controller tuning. Figure 1 shows data acquisition units attached across the terminals in the control system panels. Since most process controller inputs and outputs are 4-20ma, it is usually possible for the test equipment to pick up a voltage drop at these terminals, and test probes can be hooked onto any visible length of crimp or attached to an extension piece inserted into the terminal screw holes.
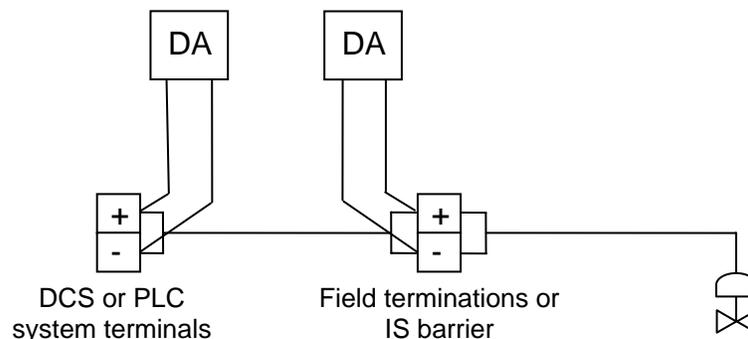

Figure 1: Connection of data acquisition units to output loop terminals

If the panel terminal rail does not provide suitable test points, take a look at the control system input/output cards as these may have screw connections onto which the test leads can be carefully attached.

On rare occasions, it is not possible to find a suitable connection point, in which case a small resistor can be added in series to the I/O loop. Figure 2 shows a resistor connected into the loop using a piece of 'chocolate block'. The test equipment is then attached across the resistor.
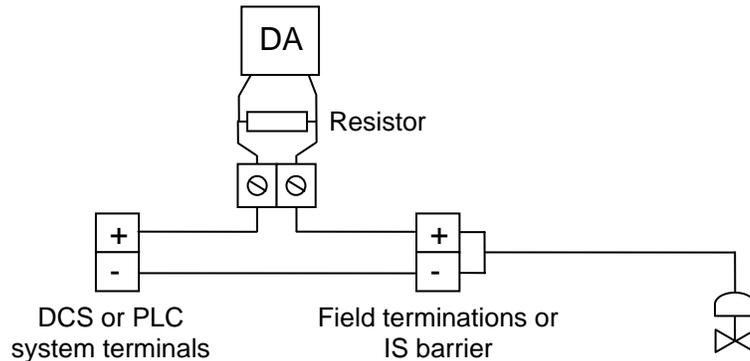

Figure 2: Connection across a series resistor

The resistor should be as small as practicable taking into consideration voltage drops around the loop and the resolution of the data acquisition equipment. I usually use a 10 Ohm resistor giving a voltage in the range of 0.04-0.2 V and definitely never exceed 100 Ohms in case the extra voltage drop affects the instrumentation. Note that inserting test resistors is not always feasible if the plant is up and running. It may be possible on input signals if the controller is placed into manual mode, although ensure that the signal is not also part of any other logic. Opening an output loop will probably drive the valve to its fail position unless there is any means of locally overriding the controller command.

As for the type of test connectors, I favor the spring-loaded hook type. I've tried the pincer type, but find that the pincers can come very close to shorting onto adjacent wires when maneuvering into position. Never use crocodile clips! These damage the insulation and can easily pull out a wire if the test lead gets snagged around a foot!

Contek Systems Ltd

Contek is an independent process control consultancy located in Aberdeen, UK and has extensive experience in analysing control engineering problems and optimising the performance of controllers in the onshore and offshore oil & gas industries.

Based on a broad practical and theoretical control engineering background, Contek is also the developer of control and mathematical applications for use on Microsoft® Windows.

References

1. U-Tune is available from www.contek-systems.co.uk

2. The Dataq browser is available from www.dataq.com